

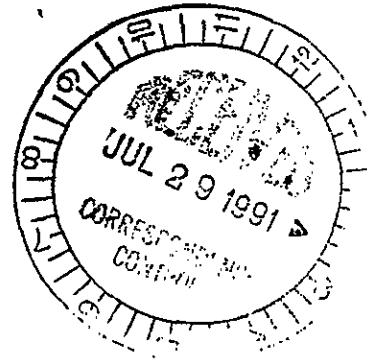


# Department of Energy

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9103410

JUL 19 1991



Mr. Paul T. Day  
Hanford Project Manager  
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Region 10  
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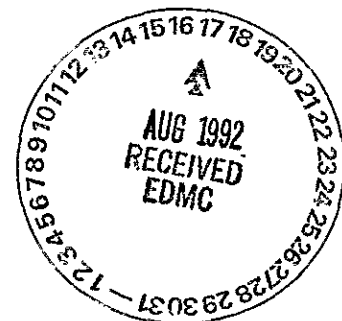
Dear Mr. Day:

RESPONSE TO THE JULY 1, 1991, EPA REQUEST REGARDING STABILIZATION OF REACTIVE MATERIAL AT THE PLUTONIUM FINISHING PLANT (PFP).

Reference: Letter, E. C. Vogt, WHC, to J. E. Mecca, DOE-RL, "Plutonium Finishing Plant Material Stabilization and Clean Out Activities," dated February 28, 1991. 12934X

The intent of this communication is to respond to the question raised by the subject request as to "what options other than restart of the Plutonium Reclamation Facility have been considered--to alleviate worker exposure concerns--." Alternatives have been evaluated against criteria and other requirements, some of which are stated below:

- Safety
  - Stability of stored material is enhanced
  - Process safety concerns which are addressed in Safety Analysis Reports
  - Storage space concerns are alleviated.
- Environmental Concerns
  - Waste generation is minimized
  - Known environmental releases are minimized.
- As Low As Reasonable Achievable (ALARA) Principles
  - Worker exposure to radiation is minimized.



Briefing material given to you during your visitation to PFP provided information regarding the safety posture of the PFP. The same information is provided in the attachments to this letter and has also been given to the State of Washington, Department of Ecology. As stated in that documentation,

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it is our judgement and the judgement of our contractor that the PFP is adversely affected by large amounts of "in process" stored reactive scrap and plutonium solutions. Areas where plant safety posture is compromised include: increased potential for pressurization of reactive scrap containers, increased potential for glovebox fires, increased worker dose due to cleanup from leaks, and criticality safety concerns with crowded storage. The presence of these materials and the resulting high background radiation prevents the completion of an accurate Plutonium Reclamation Facility (PRF) inventory and affects safeguards and security interests.

Among the options considered other than restarting the PRF are the following:

1. Maintain Current Storage of Material (No Action)

This alternative continues the storage of plutonium-bearing material at PFP without processing. This alternative does not improve the safety posture of the facility and allows for further degradation by the added accumulation of liquids, sludges and the other forms of plutonium not suitable for long-term storage. No further consideration was given to this alternative.

2. Use the PRF and the Remote Mechanical C Line

The majority of the reactive scrap items and solutions stored at PFP can be processed by dissolution and solvent extraction through PRF and stabilized into a plutonium oxide form in the Remote Mechanical C (RMC) Line. Approximately twenty percent of reactive scrap items cannot be processed through PRF without prior glovebox processing (HC-60) to reduce organic concentration of residue (Alternative 3).

Safety concerns associated with operation of PRF and the RMC Line are identified and documented in the existing Safety Analysis Report. Processing limits were established to assure safe operation of these processes.

The majority of material processed in PRF will be stabilized to plutonium oxide in the RMC Line. Approximately two percent of the plutonium may be retained as unprocessed residual (filtrate) which will be concentrated to minimize volume prior to storage. This material, along with the remaining material in the PFP vaults, will be stabilized following the NEPA Record of Decision.

While operation of these processes will not eliminate all of the solutions stored at PFP, the portion of the solutions remaining in storage would be drastically reduced, alleviating many of the current safety concerns. Operation of PRF will generate approximately 300,000 gallons of liquid waste which will be transferred to Tank Farms for storage and eventual disposal. No process related streams will be discharged to the soil column.

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Operation of PRF and the RMC Line will contribute cooling water only to the 216-Z-20 Crib. Any additional cooling water required will be off-set by reduction of other streams that currently discharge to the crib. All of the streams are predominately non-contact equipment cooling water that have a very low contamination potential.

3. Use Alternative In-Place Processes (Gloveboxes HC-60 and HC-21I)

The hydrolysis and thermal stabilization processes in gloveboxes HC-60 and HC-21I are existing processes designed to handle plutonium bearing solids. Only the reactive solid residue could be processed. None of the solutions could be processed with this alternative, leaving many liters of solution stored in PFP vaults and in PRF tankage.

This alternative alone does not improve the safety posture of the facility. Use of HC-60 and HC-21I without PRF and RMC Line processing is not responsive to the required plant cleanout and stability.

4. Use New Technology

New technology (like silver persulfate) is being developed to stabilize the plutonium material and could be utilized at PFP to further reduce waste generated and releases to the environment. These methods, however, require extensive safety review and process testing. This alternative does not provide a timely method for handling material in order to place the plant in the required safety posture.

5. Ship Material to Another Site

This alternative is not considered viable as the solid residues are "reactive" and cannot meet the Department of Transportation (DOT) shipping configuration without processing. Liquid shipments are prohibited by DOT.

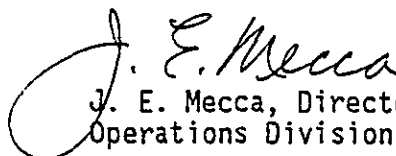
In conclusion, a review of the alternatives indicates that the only alternative that meets all of the objectives including ALARA and worker exposure is to operate PRF and the RMC Line, along with glovebox HC-60, to stabilize the bulk of the material. Some material will be stabilized in glovebox HC-21I where possible. Once the plant is placed in this improved safety posture, processing will cease until an Environmental Impact Statement is completed to define the future uses of the facility.

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It is our understanding that other informational requests in the July 1, 1991 transmission have been previously provided or discussed to your satisfaction.

If you have any added questions regarding this particular issue, please contact me immediately on 376-7471.

Sincerely,

  
J. E. Mecca, Director  
Operations Division

Attachments (2)

cc w/att:

~~R. E. Lerch, WHC~~

W. G. Ruff, WHC

R. Stanley, Ecology

T. L. Nord, Ecology

A. W. Conklin, Department of Health

## **SAFETY ISSUES - CONTAINER PRESSURIZATION**

The Plutonium Finishing Plant (PFP) was not designed to accommodate the long-term storage of large quantities of reactive scrap. Accordingly, the continued storage of chemically active Special Nuclear Material (SNM) in process gloveboxes, is of substantial concern to DOE-RL and WHC management. These concerns include safety hazards, inventory issues, and the continued surveillance requirements which add to the operator's radiation dose and to the potential for incidents. These issues create unnecessary risk to achieving plant performance objectives.

For these reactive materials there are few alternatives to storage in these gloveboxes. They cannot be placed into vault storage without further processing as the chemically active contents continuously off gas, and would cause a sealed container to pressurize and possibly rupture causing a serious plutonium contamination incident similar to that which occurred within Battelle Pacific Northwest Laboratories' 303-C storage facility in March 1979. These materials cannot be shipped offsite due to safety concerns with their chemical form and packaging. The only current solution to the pressurization issue, which reduces the risk to the plant and its personnel, is to process these materials to a stable oxide form as proposed above.

As these materials remain stored in these gloveboxes, the ingrowth of decay products adds to the radiation dose that the plant personnel will absorb which conflicts with the U.S. Department of Energy's (DOE), As Low As Reasonably Achievable (ALARA) program objective.

## **SAFETY ISSUES - POTENTIAL FOR FIRES**

The presence of a large number of unstable, chemically active items in the gloveboxes increases the potential for a fire. Fires can be caused from plutonium metal turnings and fines which contact air. On October 9, 1980, a container of scrap material, received in 1965, was repackaged in a 1-pound, slip lid can in glovebox HA-40F and bagged out. Shortly thereafter, a reaction and pressurization occurred which blew off the slip lid and breached the double plastic wrapping. The resultant fire was extinguished using a dry chemical extinguisher, but two individuals received extensive plutonium contamination and building room surfaces were highly contaminated.

Fires can also be caused by rags that are saturated with nitric acid and which are stored without further processing. Nitric acid in contact with organic material can form a cellulose nitrate which has its own oxidizer, causing the material to be highly flammable. When the Plutonium Reclamation Facility (PRF) is operating, acid bearing rags are rinsed with water or sodium hydroxide to remove residual plutonium and neutralize the nitric acid prior to disposal. Many rags saturated with nitric acid are currently being stored in gloveboxes until PRF restart. These rags present a significant increase in the fire hazard for PRF gloveboxes.

## **SAFETY ISSUES - PLUTONIUM SOLUTIONS**

The plutonium solutions stored in the PRF canyon tanks represent a continuing safety issue. Past experience has shown that long-term storage is undesirable as the solution has a high potential to leak to the canyon floor. If the solution is left on the floor, it will gel requiring a manned canyon entry to manually scrape the gelled solution from the floor. This gelling phenomena occurred at PRF in the 1976-78 time frame, when the PRF was shutdown without proper clean out of solutions from storage tankage. The cleanup resulted in high radiation doses to the operators involved in the recovery. Radiation fields in the canyon were as high as 200 millirem/hour. Immediate removal of solution from the canyon floor requires the addition of large quantities of nitric acid to the floor followed by vacuum aspiration and transfer of the aspirated liquids to PRF tankage. Limited tank space requires the PRF process to be operating for this cleanup method to be used.

An alternate that has been considered is the transfer of solutions stored in the PRF tankage to Product Receiver (PR) containers. While feasible, this approach provides additional unwarranted radiation exposure to the operators. Additionally, the subsequent load-in operation to stabilize the solution requires operators to take more exposure due to ingrowth of decay products. This is not in keeping with the DOE's ALARA policy.

During load-in of solutions left in PR containers for extended time frames, there is also an increased hazard exposure from a possible hydrogen gas fire. A flash fire from accumulated hydrogen gas in a nitrate storage container occurred at PFP in July 1976. The incident resulted in significant operator exposure and room contamination.

## **SAFETY ISSUES - CROWDED STORAGE**

As chemically active scrap storage space fills to near capacity, the large number of stored items makes management more difficult. The generation of items for storage continues during outage periods. Regardless of whether scrap stabilization processes are running, gloveboxes must be cleaned for required safeguards and security inventories, maintenance work on safety equipment generates contaminated waste, and facility contamination cleanups are needed to provide a safe environment for workers.

Storage space currently available would not accommodate the wastes that continue to be generated during an extended outage. In fact, contingency storage space to deal with unforeseen problems and protect from environmental or safety releases is now at a level considered to be minimally acceptable.

The potential for reportable incidences partially caused by crowded conditions increases as the available storage space diminishes. Infractions (not violations) of Criticality Prevention Specifications (CPSs) are more difficult to avoid when there is a maximum amount of material awaiting processing in numerous locations throughout the facility. Normal processing would reduce the potential for incidents related to the presence of material in all possible storage locations.

Due to the large number of items built up during the three years since PRF has run, several processing gloveboxes are being used as temporary storage locations. Safety hazards from this mode of operation include more exposure to operators since these gloveboxes were not designed for storage, and interference with maintenance activities since equipment movement must be coordinated with the amount and location of plutonium containing material in the area. Planned maintenance activities in these gloveboxes will present direct conflicts between maintenance requirements and the current use of these gloveboxes for waste item storage. Flexibility to move the stored material to alternate storage locations to facilitate maintenance is limited due to the near-capacity storage situation.

It is difficult to specify quantitatively the increased potential for CPS infractions associated with near-capacity storage conditions, however, several recent events have occurred that bring this concern into focus. Event Report WHC-90-211-PFP, describes a situation where a polyjar stored in a processing glovebox was inadvertently removed while a glove was being changed out for safety reasons. Normally, this glovebox would not contain stored material. Event Report WHC-90-80-PFP documents a case where labeling and procedure deficiencies resulted in a CPS infraction, but the nearly full condition of the storage glovebox certainly contributed to the potential for the occurrence. The PFP was designed to promptly process scrap materials and place them into safe-vault storage, and provision was not made for accumulation of large amounts of scrap over lengthy time periods without processing.

#### INVENTORY ISSUES

There are significant safety and safeguards concerns related to the lack of a current inventory for the PRF. An accurate inventory increases the confidence level in the amounts and locations of fissile materials. Minimizing process holdups and defining specifically where they exist via an inventory enhance the safety posture of the facility. From a safeguards standpoint, a better inventory would also provide a higher confidence that material diversion or loss has not occurred.

The Department of Energy Order 5633.3 requires an annual special nuclear material physical inventory of each Material Balance Area (MBA) within the PFP. Inventories have been conducted in all PFP MBAs with the exception of the PRF MBA. There are two primary reasons that a more accurate inventory cannot be performed. The first is that plant conditions and material form

limit the ability to perform an accurate physical inventory. The second is the lack of storage space in PRF to support cleanup for an inventory.

As stated previously, there are significant quantities of scrap and rework materials in PRF. These materials are composed primarily of concentrated filtrate from the RMC Line stored in the PRF canyon tankage, solid scrap stored in polyjars in the access bay gloveboxes, and SNM-laden rags. In addition, due to spillage and leakage, a significant quantity of material has accumulated on the glovebox floors and canyon bays. The elevated radiation background levels resulting from this holdup material prevents accurate non-destructive assay (NDA) measurements necessary for an inventory. Limit of Error on Inventory Difference (LEID) is predominantly influenced by uncertainties associated with in-place NDA of process holdup and residues. Performance of an inventory with PRF in its current state will be of poor quality with a large LEID.

Any values obtained would make a poor foundation for assessing material control in either past or future periods.

To perform an inventory which will accurately reflect actual material on hand, thus providing a LEID that is a useful control indicator, residual holdup in process bays, canyon floor and gloveboxes must be minimized. Scrap materials and solutions must be processed. Flushing and cleaning of gloveboxes will generate over 30 additional containers of solid scrap and several thousand liters of solutions. Current available storage space at PFP cannot safely accommodate this additional material as can be seen from the following table:

#### Solid Scrap Storage

-	Plutonium Reclamation Facility	102 Occupied	0 Vacancies
-	HA-23S, Room 235-B/C	190 Occupied	22 Vacancies

Several Process Gloveboxes in RMC Line and Scrap Stabilization are being used for temporary storage but are not suitable for long-term storage.

#### Solution Storage

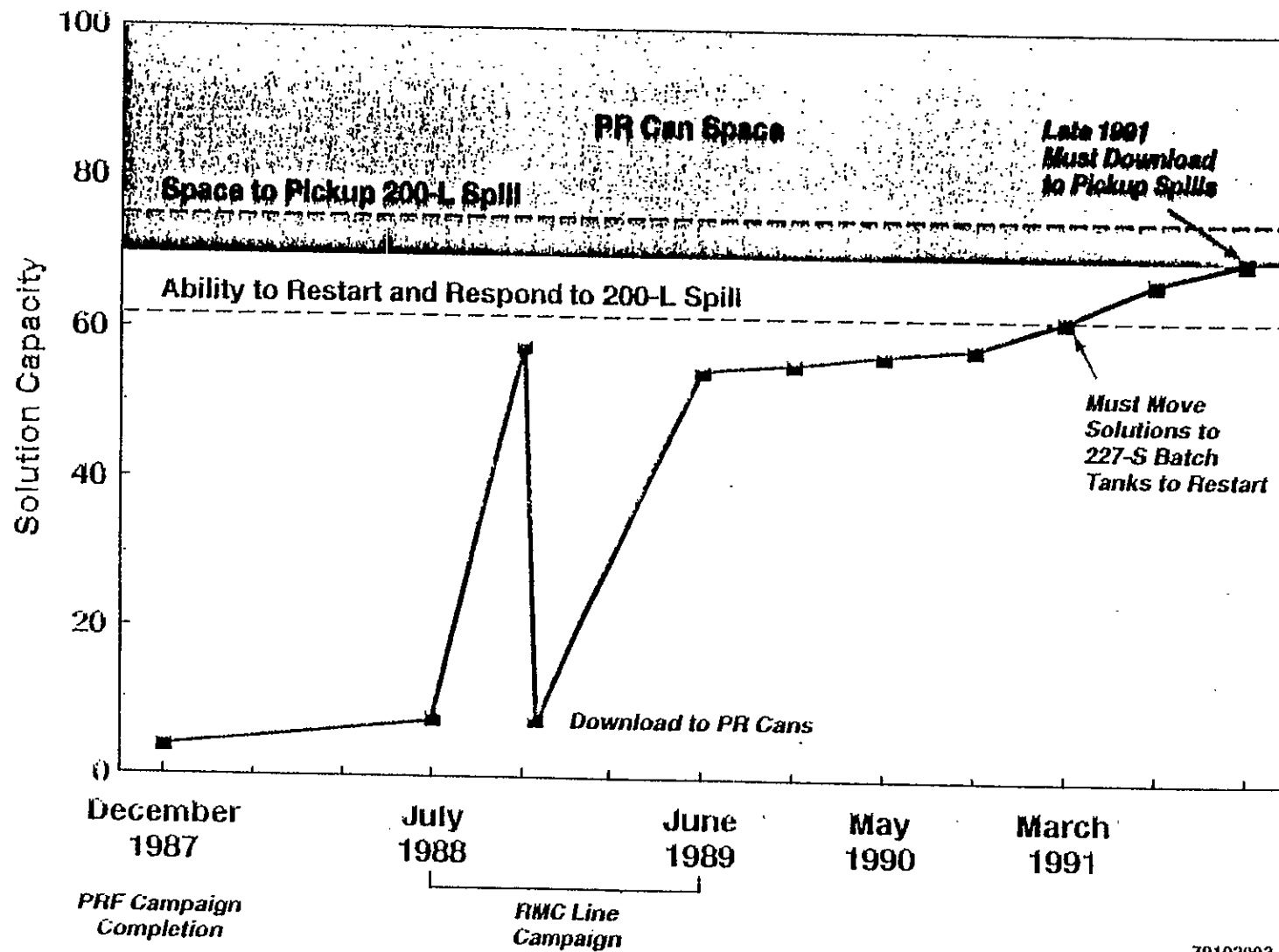
-	Vault 236 available	2400 Liters stored	560 Liters available
-	236-Z Tank Storage	1012 Liters stored	265 Liters available

Good management practice dictates that contingency storage space be maintained within PFP at all times. This contingency space is necessary to allow safe recovery from unplanned events such as spills, process vessel leaks, and repackaging of bulged containers. Currently, contingency storage space within PFP is only marginally acceptable. Figure 1, attached, shows

the current status of the PRF in regard to contingency space, and illustrates that the "crossover" point for spill response while retaining restart capability without downloading of solutions has already been reached.

Generation of more inventory items, in preparation for an inventory, without running PRF, would reduce PFP liquid and solid item contingency storage below that considered necessary for safe operations. To prevent this, loadout of solutions, involving additional personnel exposure and contributing to the inventory of stored plutonium solutions, would be required. In addition to contingency storage, use of available space for material generated during inventory preparations eliminates space tentatively assigned to accept material generated during the 232-Z source-term reduction program.

# PRF Solutions "Crossover" Point



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Incoming -  
9103410

Subject: RESPONSE TO THE JULY 1, 1991, EPA REQUEST REGARDING STABILIZATION OF  
REACTIVE MATERIAL AT THE PLUTONIUM FINISHING PLANT

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